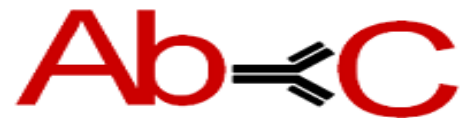


Serial assessments of hybrid immunity to SARS-CoV-2 from infection and vaccination in Canadian adults



Action to beat coronavirus
Action pour battre le coronavirus

Ab-C Study Team
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Patrick Brown, for the Ab-C Study Team
Funding: CITF, CIHR, Unity Health, Pfizer Medical Grants
COI to declare: NONE

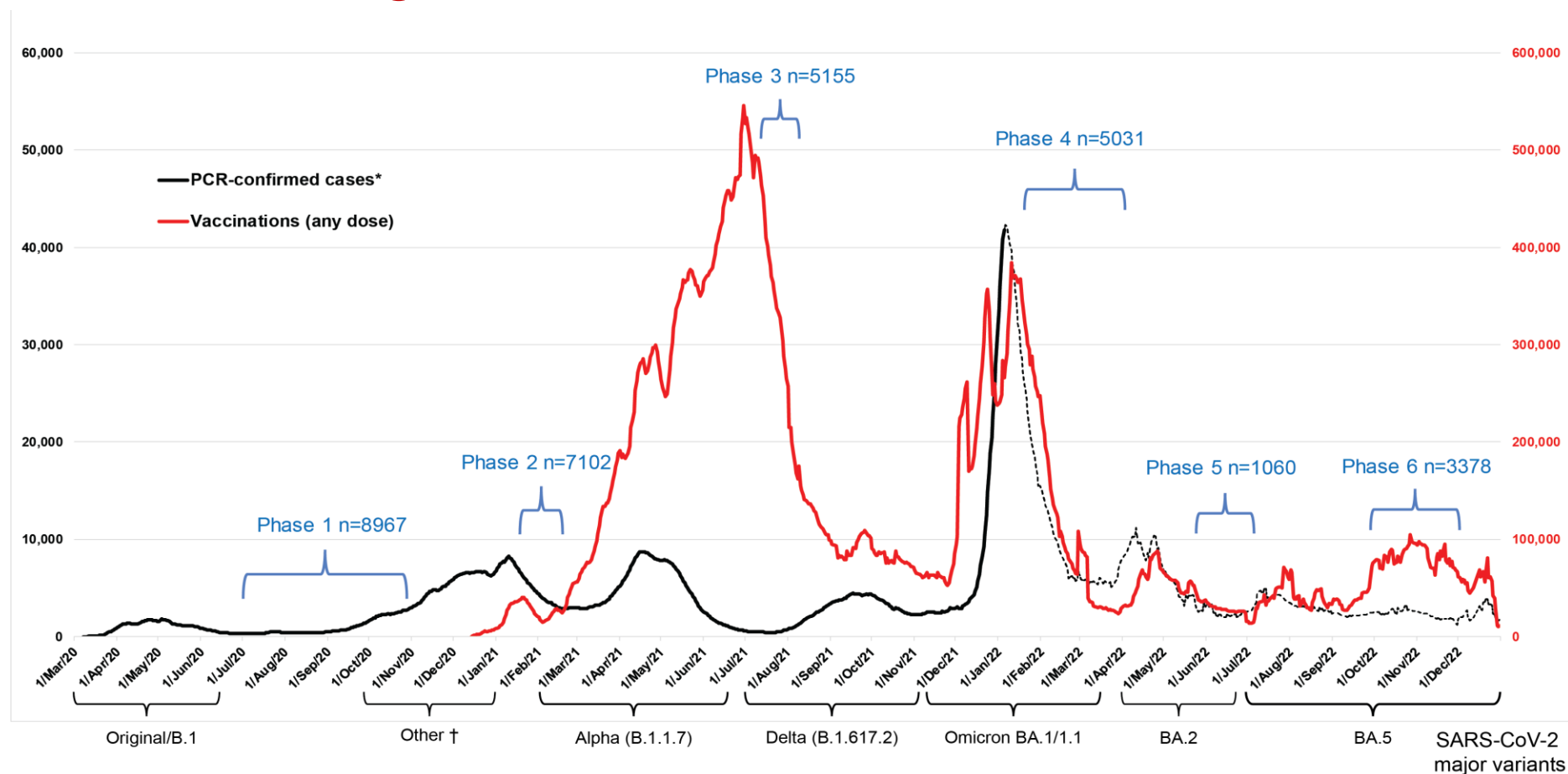


Action to beat coronavirus
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Conclusions: Canada (33 million adults)

1. Low cumulative adult COVID infection (~**13%**) prior to Omicron
2. Omicron BA.1/1.1 cumulative incidence of ~**36%**
3. Omicron BA.2/5 cumulative incidence at ~**78%**
4. 25M Canadian adults infected, 30M+ double vaccinated, so “Hybrid immunity” is high
5. COVID death rates per week lower during Omicron BA.2/5 than BA.1/1.1
6. Key vulnerabilities remain (vaccination >6 months ago, esp. in older adults)
7. Ongoing epidemiological studies (serosurveys, mortality studies) essential to guide vaccine programs and document long-COVID

Comparison of Ab-C study Phases 1-6 with weekly averages of COVID cases and vaccinations

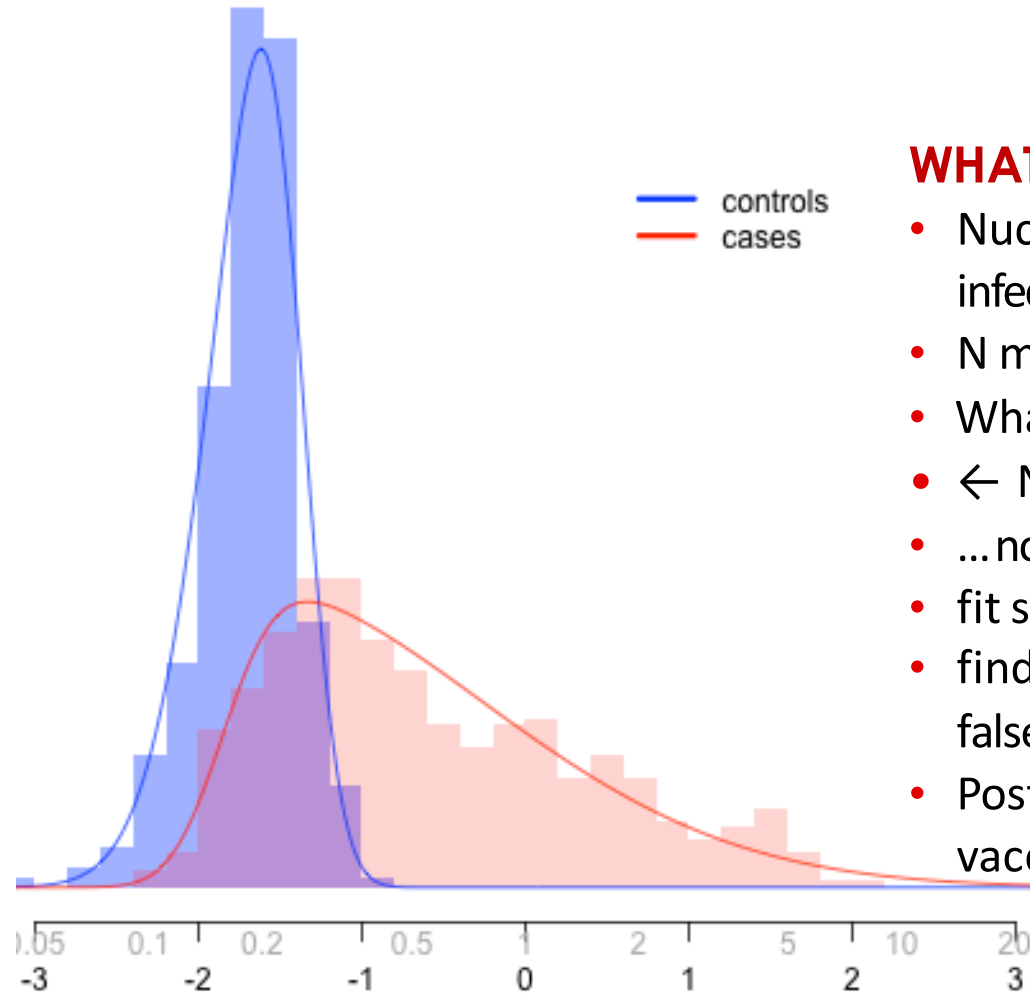


Ab-C cohort representative on smoking, BP, diabetes & obesity but had fewer less educated adults and more vaccinated adults. Hence incidence are standardized to vaccination levels of Canadians. Biases were mostly unchanged between phases.

NEJM, 2022; updated and under review

Omicron BA.2/5 wave analyses

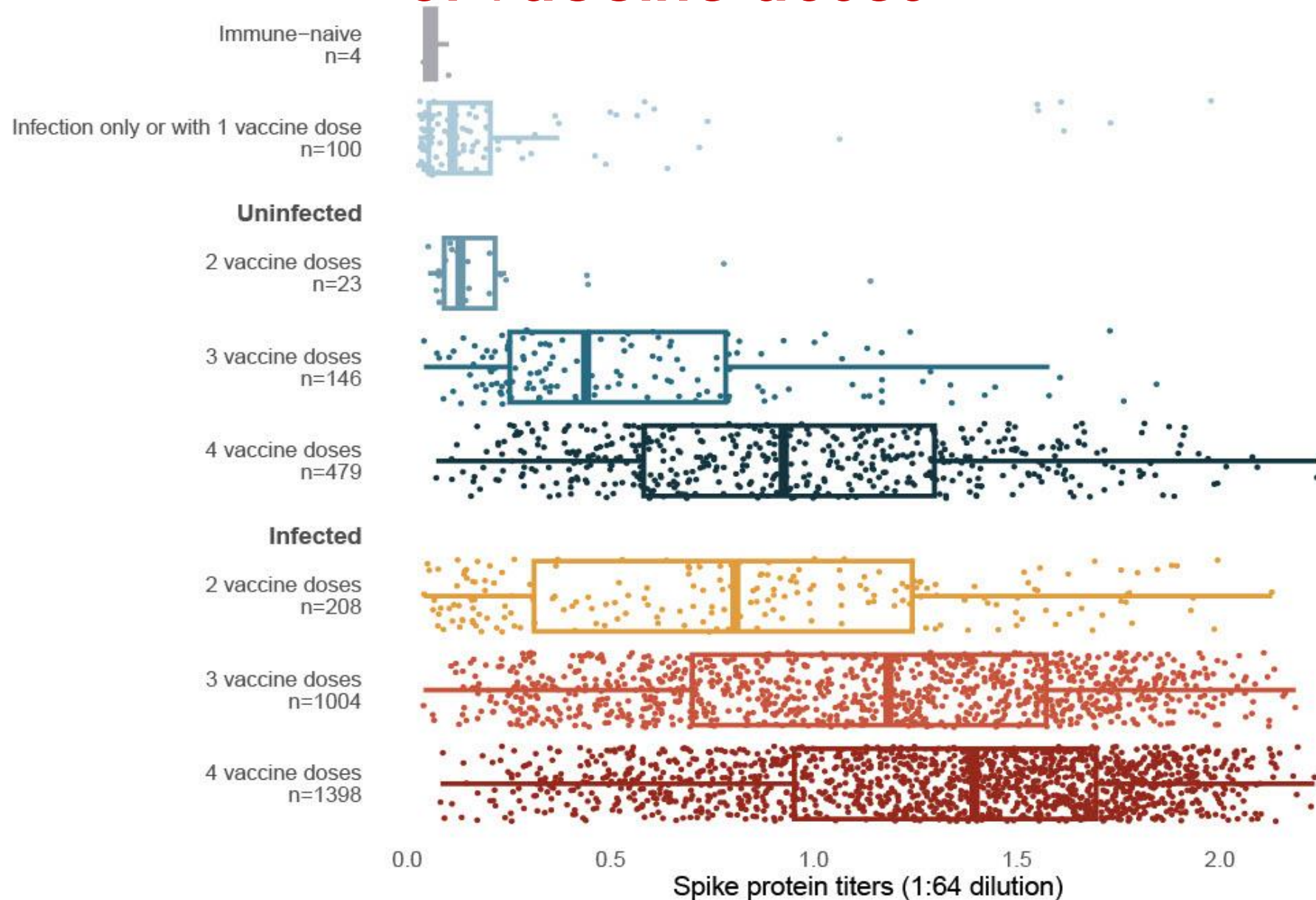
- Analyses of adults with testing and vaccination histories



WHAT'S POSITIVE?

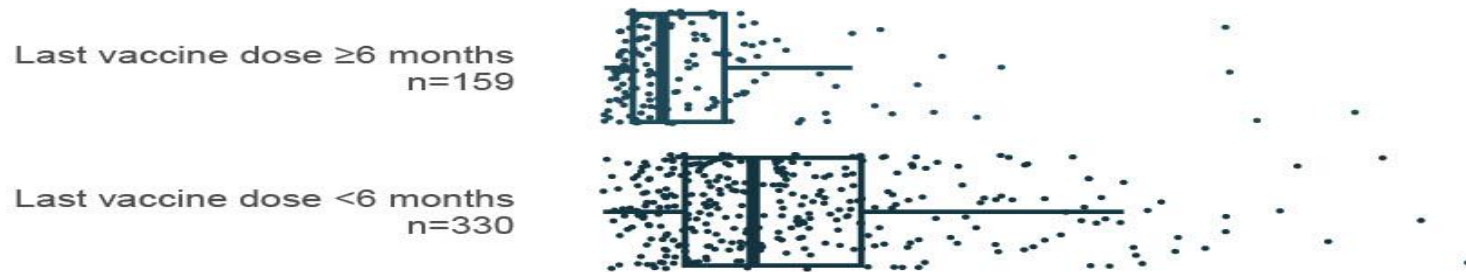
- Nucleocapsid protein (N) responds to infection, not vaccination in Canada
- N measured from DBS is noisy
- What should be considered 'positive'?
- ← N from known infections and controls
- ...note the overlap
- fit skew-Normals to each
- find cutoff where false positives equals false negatives
- Post stratification for age, sex, region, vaccination for cumulative incidence

Spike protein titers by infection and number of vaccine doses

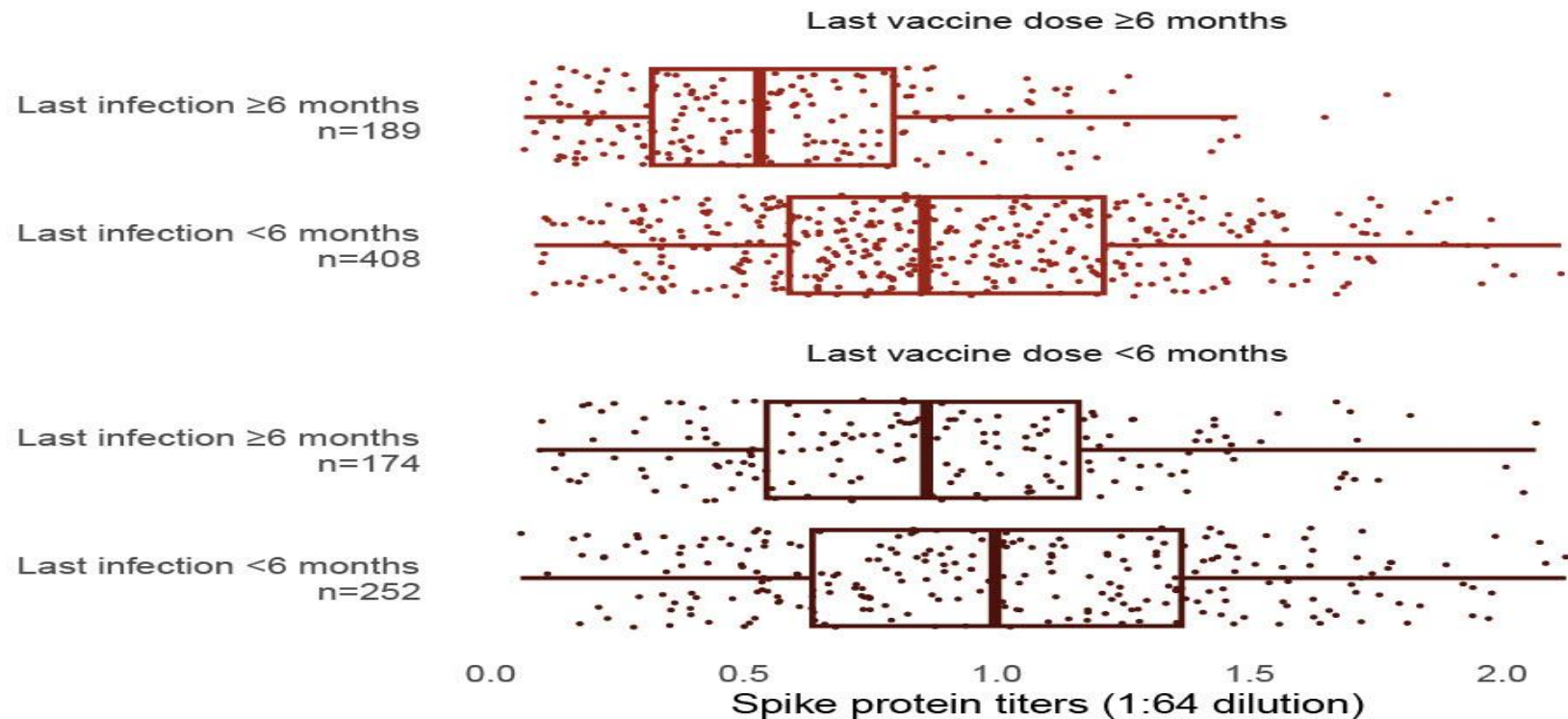


Spike protein titers by timing of infection and vaccination

(A) Uninfected by time of last dose



(B) Infected by time of last dose and infection



Substudy on cellular immunity

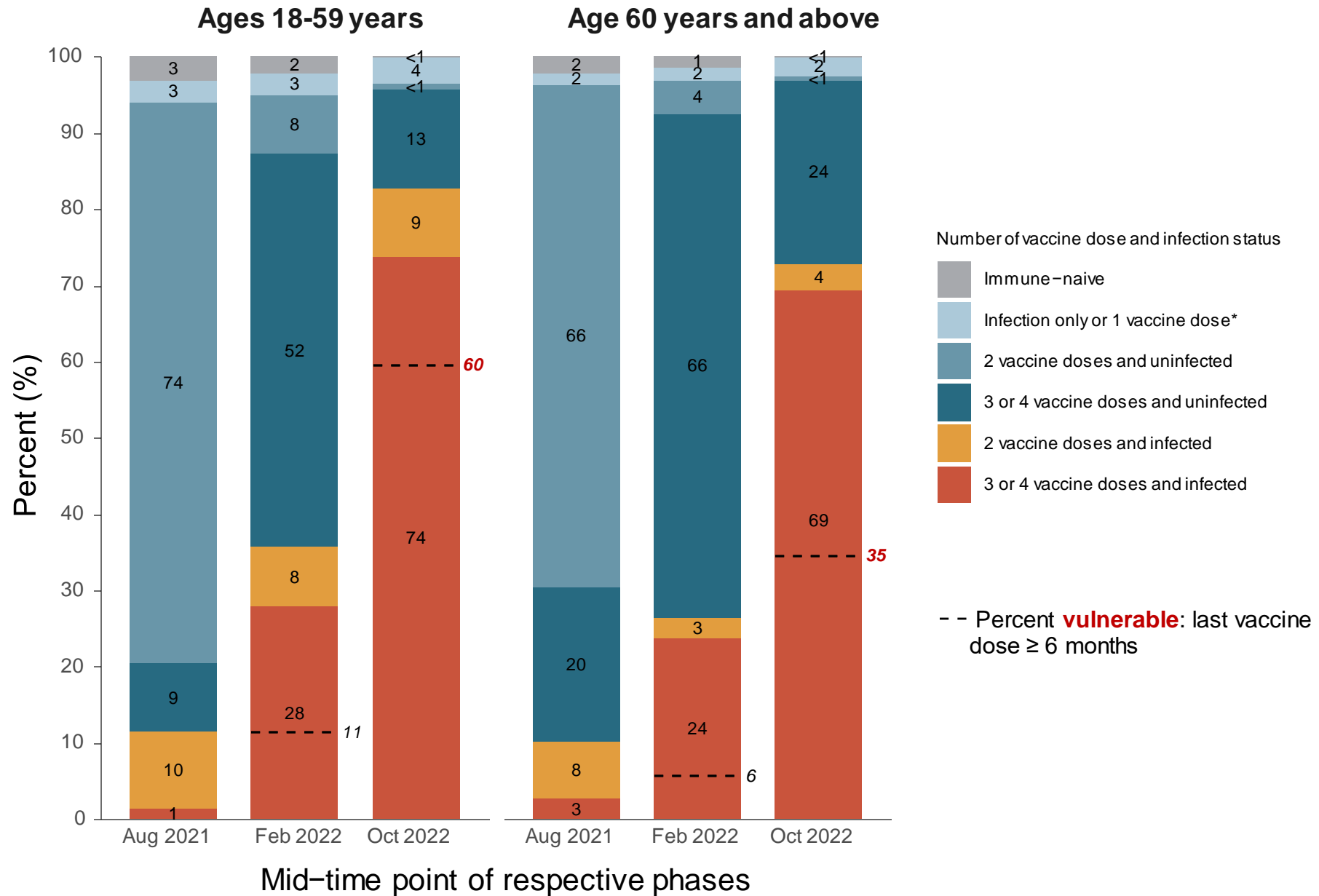
- Population: convenience sample (n=54), from Ab-C survey participants in Greater Toronto Area
- Whole blood samples drawn at home from April-May 2022
- SARS-CoV-2 Interferon Gamma Release Assay for T-cell activity to spike protein

Subgroup	N	Positives
Vaccinated, sero +	30	30 (100%)
Vaccinated, sero -	3	3 (100%)
Unvaccinated, sero +	2	1 (50%)
Unvaccinated, sero -	5	2 (40%)

Cumulative incidence, numbers of infected adults, cumulative deaths and period COVID mortality rate in Canada during SARS-COV-2 viral waves

Time period	Cumulative incidence % (95% CI)	No. of adult infections in millions	Cumulative no. of deaths	COVID mortality rate per million per week during the relevant time period
Pre-Omicron, 2020-21	12.7 (11.2–14.1)	3.9 (3.5–4.4)	30,149	8.6
BA.1/1.1 Jan.-Mar. 2022	35.7 (34.0–37.4)	11.3 (10.7–11.8)	37,750	16.6
BA.2/5 Apr.-Dec. 2022	77.7 (75.7–79.6)	24.6 (23.9–25.2)	49,674	7.7

Population level immunity pre and during Omicron



Future steps on Ab-C Study

1. Detailed analyses of antibody responses by phase
2. Long-COVID prevalence and duration of symptoms (see Fu et al, CITF poster) <https://www.youtube.com/watch?v=5zB9mxIGJR4>
3. Collaborate with Stats Canada (and others) on pooled analyses of national DBS studies
4. Consider “clean up” survey in summer 2023 to capture XBB.1.5 experience and final survey in 2024 for long-COVID persistence
5. Consider multiplex testing of archived DBS samples (~60,000 including Stats Canada study) for biomarkers and co-infections (flu?) that predict declines in hybrid immunity or predict duration of Long-COVID symptoms

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Lessons learned

- Representative, nationwide studies are essential
- Home-based DBS sampling is a cost-effective, practicable platform for routine and pandemic serosurveillance
- Public-private partnerships for surveillance should be considered

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